

APRIL 2024



About Chintan Environmental Research and Action Group

We are a registered non-profit organisation dedicated to achieving inclusive, sustainable, and equitable growth for all. We aim to make consumption more responsible and less taxing on the environment and the underprivileged. We conduct research, advocate for, and assist various stakeholders in transitioning from a linear to a circular economy and away from unsustainable consumerism. We combat air pollution by conducting research, strengthening capacity, and making science and policy more accessible to the public. In all our efforts, vulnerable populations—the poor, the marginalised, children, and women are at the forefront of our attention.



APRIL 2024



Research Team Bharati Chaturvedi, Ayush Garg, Nirmal John, Shruti Sinha

Editorial Advisor Chetan Bhattacharji

Editorial Design

DamageControl

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List of Abbreviations

- AHI: Annual Household IncomeAQI: Air Quality IndexCAQM: Commission for Air Quality ManagementCensus: Census of India: 2011
 - **CO:** Carbon Monoxide
 - **CPCB:** Central Pollution Control Board
 - DG: Diesel Power Generator
 - GHG: Green House Gases
 - Govt.: Government
 - Km: Kilometer
 - LPA: Lacs per Annum
 - NCR: National Capital Region
 - NCT: National Capital Territory of Delhi
 - NH3: Ammonia
 - NOx: Oxides of Nitrogen
 - O3: Surface Ozone
 - PM: Particulate Matter
 - SOx: Oxides of Sulphur
- WHO: World Health Organization
- WWF: World Wildlife Fund
- µg/m3: Microgram per cubic meter



Executive Summary

s cities urbanize rapidly, air pollution intensifies. Nearly 100% of India's population breathes air that does not meet quality standards set by the World Health Organization (WHO).¹ In fact, 60% of Indian cities have air quality at least seven times worse than the prescribed WHO standards.² The National Capital Territory (NCT) of Delhi is ranked the 4th most polluted city in the world. The surrounding regions within the National Capital Region (NCR), including New Okhla Industrial Development Authority (NOIDA), Ghaziabad, Faridabad and Gurugram, are ranked among the 40 most polluted cities in the world.

There is ample evidence linking air pollution with both short-term and long-term effects on health, with children, women and the urban poor most vulnerable. Exposure to PM 2.5 causes respiratory, neurological, and cardiovascular issues, including lung cancer, stroke, and heart disease.³ In 2019 alone, 17.8% of total deaths in India were attributed to air pollution, which amounts to a staggering 16.7 lakhs (1.67 million) lives lost.⁴

During the period of the study from December 2023 to January 2024, the air quality index (AQI) was 400+, considered highly hazardous. Spanning five cities, namely NCT of Delhi, and four surrounding cities including Gurugram, Faridabad, NOIDA, and Ghaziabad, the study assesses Knowledge, Awareness, and Perception (KAP) regarding air pollution amongst two socio-economic categories. Group 1⁵ comprises of urban poor and essential workers. Living in congested, informal settlements such as slums exposes them to indoor air pollution, and working outdoors exposes them to ambient air pollution, increasing their risk. Pedestrians and non-motorised transport users are also exposed while in transit. Group 2⁶ includes middle-class individuals living in formal housing.

The 500 respondents were surveyed using a questionnaire to gauge their knowledge on air pollution sources, terminology, awareness about health impacts and perceptions on air pollution as a priority of governance. The key findings of the report are stated below. Social media was found to be the most reliable source of information on air pollution: 29% of respondents from Group 1 and 26% from Group 2 found social media to be the most reliable source of information. While 29% of Group 1 respondents found news channels to be an equally reliable source, 23% of respondents from Group 2 found digital media platforms to be the most reliable source of information on air pollution.



SOCIAL MEDIA: MOST RELIABLE SOURCE OF INFORMATION

2. There was wide recognition of multiple anthropogenic sources of air pollution amongst respondents:

In Group 1, 33% of respondents perceived vehicles to be the main cause of air pollution, 27% attributed it to construction activities, and 20% believed stubble burning to be the major cause of air pollution in Delhi NCR.

In Group 2, 33% of the respondents believed burning of waste was responsible for air pollution, 27% deemed deforestation a culprit, and 20% thought industrial activity was a major cause of air pollution.

MOST SIGNIFICANT CAUSES FOR AIR POLLUTION: GROUP 1



3. Awareness of air pollution-related terminology was significantly lower among the urban poor: Only 10% of Group 1 respondents were aware of air pollution terms like AQI and PM 2.5, while 71% of Group 2 respondents were aware of the same. This indicates asymmetry in public knowledge of terminology related to air pollution.

KNOWLEDGE ABOUT AIR POLLUTION TERMINOLOGY



4. Negative health impacts self-reported by one-third of the respondents: 46% of the respondents in Group 1 reported health effects of air pollution, and 21% of the Group 2 respondents reported costs incurred from visits to the doctor and medical bills. Overall, 33% of respondents personally experienced negative health impacts of air pollution.

AIR POLLUTION CAUSES HEALTH PROBLEMS



5. People across socio-economic categories take measures to reduce air pollution exposure: While respondents in Group 2 tried to reduce individual exposure to air pollution by buying air purifiers and indoor plants, Group 1 respondents identified different and comparatively less costly solutions, like increasing their water intake and using N-95 masks.

COMBATING AIR POLLUTION

```
    GROUP 1
    MASKS | INCREASED WATER INTAKE [CHEAPER OPTIONS]

    GROUP 2
    AIR PURIFIERS | INDOOR PLANTS [EXPENSIVE OPTIONS]
```

6. While respondents across socio-economic groups find the government's efforts to reduce air pollution to be inadequate, Group 2 respondents do not see air pollution reduction as a priority of governance: Both Group 1 and Group 2 respondents rated the government's performance on reducing air pollution as unsatisfactory (4.5/10). This indicates public dissatisfaction with government interventions to curb air pollution. However, when asked what their priorities would be if they were the Chief Minister, Group 1 respondents rated reduction of air pollution as the fourth priority and Group 2 respondents rated it as the ninth priority.

GOVERNMENT'S PERFORMANCE ON REDUCING AIR POLLUTION



Based on the research outcomes, Chintan suggests the following steps to reduce public exposure to air pollution, enabling people to protect themselves.

EDUCATION AND AWARENESS

Social Media as a Platform for Education

The study indicates that respondents trust social media as a reliable source of information on air pollution, particularly younger populations, who will act as future decision makers and drivers of the economy. Therefore, credible scientific institutions and authorised government agencies must regularly provide accurate and verified data on air pollution, along with scientific solutions through social media campaigns and a regular flow of news.

Air Pollution Awareness in Educational Institutions

An understanding of science and protection against exposure to air pollution is vital for sustained and effective public action. Air pollution science, emphasizing prevention and reduction of exposure must be compulsory for students in class 8, 9 and 10. Colleges must also offer courses to generate interest and understanding of air pollution science amongst students.

Urban Local Bodies (ULBs) and Residential Welfare Associations (RWAs): Champions for Air Pollution Awareness

Civil society bodies with expertise on air pollution can work in partnership with Urban Local Bodies (ULBs) and RWAs, to provide easy-to-understand scientific information on air pollution. The general public will gain knowledge for prevention and reduction of exposure to air pollution, particularly for vulnerable populations such as the elderly, children, pregnant and lactating women.

STEPS FOR EXPOSURE AND HEALTH IMPACT REDUCTION

Pollution Prevention Kits

Social security schemes by ULBs must provide pollution prevention kits on a fortnightly basis, with items such as N-95 masks and industry-standard protective eyeglasses. Beneficiaries must include outdoor essential workers like street vendors, waste pickers and *safai karamcharis*, among others. For maximum reach, these schemes can be widely advertised on television, social media, radio and newspapers, along with an organized system for distribution and last-mile delivery.

Engaging doctors and paramedical professionals

Doctors and paramedical professionals in each ward, along with state health departments, must be trained to handle health impacts of air pollution and counsel patients with scientific solutions.

Innovation for low-cost Heating Solutions

Open burning during winters for heat is a significant source of air pollution. Often, outdoor essential workers or those living without shelter have no option but to burn waste to remain warm. The Central Pollution Control Board (CPCB) can invest in innovation by supporting technical experts, startups, civil society bodies etc. to develop low-cost heating solutions. Clean alternatives to burning can be scaled up with government intervention.

Strong action against open burning and violation of construction norms

The state pollution control boards must work closely with ULBs, scientists, civil society bodies and RWAs to penalize open burning and violations of construction and demolition norms.





s cities urbanize rapidly, air pollution intensifies. Nearly 100% of India's population breathes air that does not meet quality standards set by the World Health Organization (WHO).⁷ In fact, 60% of Indian cities have air quality at least seven times worse than the prescribed WHO standards.⁸ The National Capital Territory (NCT) of Delhi is ranked the 4th most polluted city in the world. The surrounding regions within the National Capital Region (NCR), including New Okhla Industrial Development Authority (NOIDA), Ghaziabad, Faridabad and Gurugram, are ranked among the 40 most polluted cities in the world.

There is ample evidence linking air pollution with both short-term and long-term effects on health, affecting many organ systems and parts of the human body. Exposure to PM 2.5 can cause respiratory, neurological, and cardiovascular illnesses, including lung cancer, stroke, and heart disease.⁹ In 2019 alone, 17.8% of the total deaths in India were attributed to air pollution, which amounts to a staggering 16.7 lakhs (1.67 million) lives lost.¹⁰

Children, women, and the urban poor are most vulnerable to adverse health impacts of air pollution. Those living in congested and polluted informal settlements are exposed to indoor air pollution. Essential workers are exposed to ambient air pollution due to the outdoor nature of their work. Pedestrians and non-motorized transport users are also exposed during transit. Minimal access to healthcare is exacerbated by financial barriers, thus makes inequity a major determinant of air pollution exposure and poor health impacts.¹¹

This study was conducted in five cities, where 66% of the Delhi NCR population resides: NCT of Delhi and four surrounding cities including Gurugram, Faridabad, New Okhla Industrial Development Authority (NOIDA), and Ghaziabad. It was carried out during the period from December 2023 to January 2024, when the AQI was at 400+, categorized as severe and highly hazardous. The aim was to assesses Knowledge, Awareness, and Perception (KAP) regarding air pollution amongst two socio-economic categories: Group 1, residents of informal slum settlements, and Group 2, middle-class residents of formal settlements. The 500 respondents were surveyed using a questionnaire to gauge their knowledge on air pollution sources, terminology, awareness about health impacts and perceptions on air pollution as a priority of governance.

GHAZIABAD

Ghaziabad, a city bordering east Delhi in the Indian state of Uttar Pradesh, is a large and planned industrial city, with a population of 46.82 lakhs (4.682 millions) (as per the 2011 Census).¹² It is well connected by road and railway, and is the educational center of western Uttar Pradesh. The major sources of air pollution in Ghaziabad are vehicular, road dust, construction and demolition activities, industries (point source and area source), garbage burning, and burning of agricultural waste.¹³ As pollution levels in the city increase each year, the AQI also deteriorates. During the decade 2001 to 2011, Ghaziabad witnessed a population growth of approximately 25% and a 160% increase in the number of vehicles.¹⁴ High traffic density, along with various meteorological factors, cause the AQI to plummet during winters. Apart from adverse effects on human health, poor air quality harms plants and deteriorates buildings and historical monuments, as materials and surfaces get degraded and decolorised due to air pollutants.¹⁵

DELHI

The National Capital Territory of Delhi (NCT of Delhi) is the largest city in the country in terms of area (1486.5 sq. km) with a population of approximately 1.68 crores (16.8 million), making it the second most populous city in India.¹⁶ Delhi's air pollution peaks during the winter months and deteriorates as lower surface temperatures increase the demand for space heaters.¹⁷ The pollution levels are lowest during the monsoon season.

Delhi's air pollution is a year-round problem, with substantial contributions from vehicle exhaust, road dust, construction dust, cooking and heating, open waste burning, light and heavy industries, and diesel generator sets. There are also seasonal sources of air pollution such as agricultural or stubble burning and dust storms. Some of the pollution originates outside Delhi.¹⁸

India's judiciary, most notably the Supreme Court and the National Green Tribunal, has played a crucial role in addressing the air pollution problem in Delhi. In some cases, they have even mandated technical, economic, and institutional solutions ahead of the respective national and state departments.¹⁹ Despite these efforts, in 2022, Delhi's air quality ranked the worst among the world's capital cities.²⁰

GURUGRAM

Bordering south-west Delhi, Gurugram is the second largest technology hub in the country and is referred to as the Millennium City of India.²¹ It has the highest carbon footprint in India, with over 2 tons of CO₂ per capita.²² The geographical area of Gurugram city is approximately 673km².²³ As of 2021, the city's population stands at about 18.7 lakhs (1.87 million), according to the mobility report for Gurugram.²⁴ Gurugram faces high levels of localised air pollution due to transportation.²⁵ The lack of public transport options in Gurugram results in high personal vehicle ownership and pollution.²⁶ The city has one of the highest vehicle ownership rates in the country, at 323 cars per 1,000 people, which is higher than Delhi, which is at 88 cars per 1000 people.²⁷ In Gurugram, 43% of households own two-wheelers and 33% own cars.²⁸ The number of buses has not increased much, standing at 50% less than the service level benchmark of 60 buses per lakh population. In 2014-15, the benchmark was 31 buses per lakh population.²⁹ The city is already congested by more than 75%, signaling rapid progression towards road space saturation.³⁰ Resultant traffic congestion significantly contributes to greenhouse gas emissions and air pollution, further exacerbating environmental issues and climate-related risks.³¹

In 2018, Gurugram was ranked the most polluted city in IQAir Visual's 2018 World Air Quality Report.³² In March 2019, Gurugram was again named the seventh most polluted city in the world by IQAir Visual's 2019 World Air Quality Report.³³ Other sources of air pollution include industries, thermal power plants, diesel generators, residential sources, construction, road dust, waste combustion, and seasonal stubble burning.³⁴

FARIDABAD

Faridabad, bordering south-east Delhi, is one of the largest cities in the Indian state of Haryana. In the last assessment year, the city had a total population of 18.1 lakhs (1.8 million) and an estimated population of 20 lakhs (2 million) for the year 2021. Faridabad has an average AQI of 107, which falls under the moderate category as per the Central Pollution Control Board (CPCB) norms. However, in October 2022, the AQI hit the 400 mark post Diwali, as the PM2.5 (particulate matter of 2.5 microns suspended in one cubic cm area) was recorded at 400 μ g/m3.³⁵ During this time, the city supposedly had the worst air quality in the country, according to a CPCB official application named Sameer.³⁶ Particulate Matter (PM10; PM2.5) has been identified as the main air pollutant, as it falls above the prescribed national standards. In 2020, the city's PM10 and PM2.5 average levels were 119 μ g/m3 and 115 μ g/m3 respectively. In addition to PM2.5, nitrogen dioxide has also been detected at alarming levels. The main sources of air pollution in Faridabad are vehicular emissions, road dust, burning of biomass and garbage, industrial emissions, mining, and construction-demolition activities.

NEW OKHLA INDUSTRIAL DEVELOPMENT AUTHORITY (NOIDA):

New Okhla Industrial Development Authority (NOIDA) is part of the National Capital Region of India. As per the reports of the Census of India, the population of NOIDA in 2011 was 6.4 lakhs (0.64 million). According to the CPCB, PM 10 is the main and constant pollutant in NOIDA throughout the year, while PM 2.5 levels tend to fluctuate and are particularly prevalent during the winters. The major sources of air pollution in NOIDA are vehicular, road dust, construction-demolition activities, industries (point source and areas source), and burning of garbage and agricultural waste.³⁷





his rapid survey covers two socio-economic groups. A proxy was taken for lower income groups, assumed to be living in informal settlements (Group 1) and mid to high income groups assumed to be living in formal, *pucca* housing (Group 2). The survey was undertaken across five cities (Delhi, Faridabad, Ghaziabad, Gurugram and NOIDA) across the National Capital Region (NCR).

Figure 1: Map of Study Area (within NCR)



This cluster of cities is part of the same airshed, or a common geographical area where pollutants are trapped, resulting in similar air quality for everyone.³⁸ As part of the National Capital Region, these areas witness intercity transit. For instance, a lot of people travel for work or leisure from Gurgaon to Delhi or Delhi to NOIDA or vice versa.

In each city, 50 respondents were selected from each group. These were further broken down into two informal and two formal housing areas, to reflect the perceptions of a wider range of respondents.

Surveyors were trained and an online questionnaire (Annexure 1) was shared in both English and Hindi. The concept of consent was explained, and the respondents' informed consent was obtained through signed consent forms in both Hindi and English.

The data collected was organized and analyzed. The trends were discussed with the research team and conclusions and recommendations were drawn from the same.



DEMOGRAPHIC PROFILE

Age Group and Gender

- 88% of respondents were of working age (18-60 years)
- 51% of respondents were female, 48% were males, and the remaining 1% preferred not to state their gender.

Work and Employment

- 45% of the respondents were informal workers, while 21% were unemployed or not working.
- 91% of the respondents in the Group 2 areas were informal workers, while 30% of the respondents in Group 2 settlement areas were unemployed or not working.
- 44% of female respondents in Group 1 and 38% of female respondents in Group 2 identified as working women.

Income

- 63% of the total respondents earned under the taxable bracket, i.e. 3 lakhs per annum (LPA) and 24% earned between 3 and 12 LPA.
- 96% of the respondents in Group 1 (46% women) had a household income below the taxable bracket, i.e 3 LPA
- 28% of respondents in Group 2 (19% women) had a household income below the taxable bracket, i.e 3 LPA.





SOURCES OF INFORMATION ON AIR POLLUTION

All the respondents were asked to state the most reliable sources of information on air pollution. The responses are shown in Figure 2.

Group 1:

- 29% of respondents considered social media to be a reliable source of information on air pollution
- 10% found newspapers to be the most reliable source of information on air pollution
- 4% found online news sources to be a reliable source of information
- 29% found news channels to be a reliable source of information

Group 2:

- 26% considered social media to be a reliable source of information on air pollution
- 11% found newspapers to be the most reliable source of information on air pollution
- 23% found online news sources to be a reliable source of information
- 15% found news channels to be a reliable source of information

In terms of age-wise trends, respondents in the age-group 18-30 preferred social media as a source of information (31.8%), while people above the age of 30 found news channels to be a reliable source of information on air pollution (39.4%).



Figure 2: Reliable sources of information on air pollution among Group 1 [Blue] and Group 2 [Orange].

Most reliable source of information on Air Pollution among Group 1 & Group 2

In Group 1, 35% of the respondents in the age category 18-30 preferred social media, and in Group 2, 30% of respondents in the age category 18-30 preferred social media. This indicates a clear preference for social media among youth across socio-economic categories.

Social media turned out to be the most effective for both urban poor and affluent populations. While the role of newspapers has diminished for everybody, poor people still look to news channels. Wealthy people prefer online resources. Poor people rely more on area announcements than centralised government advisories, while the rich rely on them conversely.

PERCEPTIONS OF THE SOURCES OF AIR POLLUTION

Respondents were asked what they believed to be the main sources of air pollution. Figure 3 illustrates these perceptions. In Group 1, 33% of respondents believed that vehicular pollution was the main cause of air pollution, 27% attributed it to construction activities, and 20% believed stubble burning was the major cause of air pollution in Delhi NCR. In Group 2, 33% of respondents believed that burning waste was the main cause of air pollution, 27% believed that deforestation was the culprit, and 20% considered industrial activities to be the largest contributor to air pollution.



Figure 3: From Left to right- Perception on sources of Air Pollution among Group 1 and Group 2.

According to a 2018 report published by TERI, construction and demolition activities, vehicular emissions and biomass burning are the predominant contributors to air pollution across Delhi NCR.³⁹ This aligns closely with what Group 1 respondents believed were the main sources of air pollution. This indicates an understanding amongst the urban poor that activities connected to the richer sections of society, such as owners of real estate and cars, cause more air pollution. Meanwhile, respondents in Group 2, who actually belong to a wealthier socio-economic category, do not recognize the same.

KNOWLEDGE OF TERMINOLOGY (AQI, CAQM, PM2.5) IN GROUP 1 AND GROUP 2

Respondents were tested on their awareness of following air pollution terms:

Air Quality Index (AQI), Particular Matter (PM 2.5) and Commission for Air Quality Management (CAQM).

Knowledge	Knowledge of AQI & Other Terminologies: Group 1 (%)									
Response	Delhi		Faridabad		Ghaziabad		Gurugram		New Okhla Industrial Development Authority (Noida)	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
No	96	96	100	76	84	76	100	100	94	78.1
Yes	4	4	0	24	16	24	0	0	6	22

Table 1: Number of respondents in Delhi NCR's Group 1 familiar with AQI, CAQM and PM 2.5

Overall, female respondents in Group 1 were less aware of air pollution related terms as compared to their male counterparts.

Respondents of Ghaziabad were more aware of air pollution-related terminology as compared to all other cities in Delhi NCR.

Table 1 illustrates the number of respondents from Group 1 across Delhi NCR that were familiar with terms such as AQI, CAQM and PM2.5. None of the residents from Group 1 in Gurugram were familiar with these terms. In Delhi, only 4% were aware of these terms. Overall, Group 1 performed poorly in terms of awareness of air pollution terminology, with 90% of respondents unaware.

There is a disproportionately large gap between the two groups surveyed in their understanding of air pollution. On the other hand, Table 2 illustrates that female respondents in Group 2 were more aware of air pollution-related terminology as compared to their male counterparts. In Group 2, respondents across Delhi NCR were largely aware, with 71% of respondents familiar with terms like AQI, CAQM, and PM2.5.

Awareness about terms like AQI and PM 2.5 are critical to understand and quantify the severity of air pollution. The lack of a quantifiable understanding of air pollution limits the ability to respond effectively to reduce exposure in accordance.

 Table 2: Number of respondents in Delhi NCR's Group 2 settlement areas familiar with AQI, CAQM and PM 2.5

Knowledge AQI & Other Terminologies: Group 2 (%)										
Response	Delhi		Faridabad		Ghaziabad		Gurugram		New Okhla Industrial Development Authority (NOIDA)	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
No	12	20	33	24	34	25	21	33	14	17
Yes	85	76	66	76	48	45	76	62	82	79
Not Sure	4	4	0	0	17	30	3	5	5	3



Knowledge about Health Impacts of Air Pollution

TRAVEL TO WORKPLACE

Group 1 and Group 2 respondents also took part in a survey to ascertain the frequency with which they travel to work despite the severity of air pollution. Figure 5 illustrates the number of times respondents across Delhi NCR have to travel in a week. In Group 1, 49% of respondents travel to work at least 5-7 days a week. On the other hand, 30% of respondents do not travel for work. This could be attributed to the informal nature of their work. Similarly, in Group 2, 58% of respondents travel on all working days (5 days a week). This indicates that respondents traveled to work regardless of air pollution.



Figure 4: Work-related Travel frequency across the Study area

IMPACTS OF AIR POLLUTION

Respondents were asked to state the ways in which air pollution affects them, including health impacts on themselves, family members or those around them.

Group 1 Respondents

Respondents were asked to state their experience of the impacts of air pollution. Figure 5 represents participant experience in Group 1 areas. The answers included health impacts on oneself, health issues faced by children, health issues faced by other family members and mental health issues due to frustration about the dire situation.

In Group 1, 46% of respondents reported that they personally experienced physical health impacts of air pollution. In NOIDA, at 55%, the largest proportion of Group 1 respondents reported that they felt the health impacts of air pollution. In Delhi, at 39%, the lowest proportion of respondents reported experiencing health impacts of air pollution. Further 23% of females and 22% of males experienced health impacts of air pollution.



Figure 5: Perception of Probable Impact of Air Pollution-Group 1

In Group 1, 25% of respondents reported health impacts of air pollution on children, with Gurugram and Delhi having the largest proportion of such reportage (at 30% for both).

Group 2 respondents

Respondents from Group 2 expressed six ways in which they experienced the impacts of air pollution. 21% of Group 2 respondents stated that they were forced to spend on doctors and medical treatments due to air pollution. At 19%, Delhi saw the highest number of respondents reporting that they were forced to spend on doctors and treatment due to air pollution, whereas only 15% in Gurugram reported medical expenses, making it lowest amongst the five cities.

- **13%** reported the impact of air pollution on their maids and domestic helpers' health.
- 34% reported that they observed its impact on their relatives and friends.
- 16% reported that they were forced to spend on air purifiers due to air pollution, while 17% reported that they were forced to stay home.



Figure 6: Perception of Probable Impact of Air Pollution-Group 2

Both groups are aware of the health effects of air pollution, but coping mechanisms vary, depending on cost. The wealthy class can afford air purifiers, but still feel forced to buy them. In Gurugram, at 21%, the largest proportion of people reported that they were forced to spend on air purifiers, whereas in Ghaziabad, at 10%, the smallest proportion of people reported the same.

Overall, 33% of all respondents from Group 1 and Group 2 connected air pollution to their health issues and medical treatments. NOIDA and Ghaziabad were the two cities where the largest proportion of respondents (at 84% and 63% respectively) did not connect air pollution to their health and well-being.

EXPOSURE REDUCTION ACTION AND BEHAVIORAL MODIFICATIONS

Measures taken by respondents in Group 1

To reduce exposure to air pollution, 72% of respondents in Group 1 areas reported taking protective measures.

As indicated in Figure 7, 27% of respondents opted to wear masks, including N95 masks, to reduce exposure to air pollution.

In Gurugram, at 37%, the maximum number of Group 1 respondents wore masks, followed by 32% in Delhi. In Faridabad, at 19%, the least number of respondents wore masks.



Figure 7: Perception on acceptable solutions- Group 1

MEASURES TAKEN BY RESPONDENTS IN GROUP 2

Figure 8 illustrates the perceived solutions among respondents in Group 2 areas to the issue of air pollution. In Group 2, 73% of respondents were taking some sort of protective measures against air pollution.



Figure 8: Perception on acceptable solutions - Group 2

While 16% of respondents reported wearing N95 masks to reduce exposure, and 13% worked from home on the days with poor AQI, an equal share of respondents (12%) chose to not exercise to reduce air pollution exposure or purchase and use air purifiers and indoor air purifying plants. In terms of a city-wise comparison, Gurugram and NOIDA had the most number of respondents that purchased air purifiers and indoor plants to reduce exposure to air pollution.

In Gurugram 15% and 13% of respondents purchased air purifiers and indoor plants respectively, while 13% and 17% of respondents in NOIDA did the same.

A comparison between Group 1 and Group 2 indicates that while Group 1 respondents only adopted measures such as wearing masks, Group 2 also took additional measures like buying indoor plants and air purifiers. This indicates the direct correlation between high economic status and access to solutions to mitigate exposure to air pollution.





AIR POLLUTION AS A PRIORITY

To ascertain what governance priorities should be, the survey provided a hypothetical situation, asking respondents to rank their priorities from 1-5 if they were the Chief Minister. Table 3 illustrates the order of priorities among respondents in Group 1 and Group 2.

Rank	Priority of Group 1
1.	Poverty alleviation
2.	Price and rate control
3.	Job creation
4.	Reduce Air Pollution
5.	Fight climate change
6.	Education and Literacy
7.	Planting trees and preserving forests
8.	Reduce plastic usage and waste
9.	Anti-corruption
10.	Violence against women
11.	Enforcement of Law
12.	Make India Global Superpower

Table 3: The main priorities among respondents in Group 1

Respondents in Group 1 areas across Delhi NCR stated that poverty alleviation would be their highest priority. Reducing air pollution ranked at fourth place.

Table 4	The main	nriorities	among	respondents	in	Grour	2
	THE IIIUIII	priorities	uniong	respondents		Oroup	<i>' ∠</i>

Rank	Priority of Group 2
1.	Reduce plastic usage and waste
2.	Make India global superpower
3.	Violence against women
4.	Poverty alleviation
5.	Price & rate control
6.	Enforcement of Law
7.	Anti-Corruption
8.	Education & literacy
9.	Reduce Air Pollution
10.	Fight Climate Change
11.	Jobs creation
12.	Planting trees and preserving forest

Respondents in Group 2 believed that the highest priority must be given to reducing plastic usage and waste. Making India a global superpower was second on their list of priorities. Reducing air pollution ranked ninth in their order of priorities.

RATING GOVERNMENT EFFORTS TO CURB AIR POLLUTION

Respondents were also asked to rate the government's action on air pollution on a scale of 1 to 10 at the city level.

Respondents who rated the government's efforts at 1 out of 10 felt the government has made minimal efforts to address the issue of air pollution. A rating of 10 indicates that the government has made serious and successful attempts to address air pollution.

Figure 9 shows the perception among respondents in Group 1 of Delhi NCR. Overall, respondents in Group 1 believe that the government's efforts to reduce air pollution were not enough, with an average rating of 4.5/10. In particular, male (2.2/10) and female (3.0/10) respondents in Gurugram's Group 1 believed that there was very little effort made by the government to address air pollution.



Figure 9: Perception based scoring of Govt. Initiatives and Interventions- Group 1

Respondents from Group 1 are satisfied with the government's initiatives in NOIDA (6.4/10 among males and 5.8/10 among females) and Ghaziabad (5.8/10 among males and 6.4/10 among females) compared to Gurugram (2.2/10 among males and 3.0/10 among females), where respondents expressed least satisfaction.

Figure 10 shows the perception of inhabitants in Group 2 areas and their rating of the government's effort to curb air pollution on a scale of 1 to 10. 4.4 was the average rating in all five cities across Delhi NCR. In particular, male (4.5/10) and female (3.8/10) respondents in NOIDA believe that there was very little effort made by the government to address air pollution.



Figure 10: Perception based scoring of Govt. Initiatives and Interventions- Group 2

with the performance of their governments on prevention and exposure reduction to air pollution, when asked about governance priorities, air pollution did not feature amongst the top 3 for either group.

CONCLUSIONS AND RECOMMENDATIONS:

This report discusses the results and survey data for two different socio-economic groups, i.e. Group 1 and Group 2 spread across 5 cities of Delhi NCR (Delhi, Faridabad, Ghaziabad, Gurugram and NOIDA). A total of 500 respondents (250 from Group 1 and 250 from Group 2) participated in the study. The following section discusses the conclusions drawn from the study. The conclusions based on the data are as follows:

- Social media was found to be the most reliable source of information on air pollution: 26% of respondents from Group 1 and 29% from Group 2 found social media to be the most reliable source of information. While 29% of Group 1 respondents found news channels to be an equally reliable source, 23% of respondents from Group 2 found digital media platforms to be the most reliable source of information on air pollution.
- 2. There was wide recognition of multiple anthropogenic sources of air pollution amongst respondents:

In Group 1, 33% of respondents perceived vehicles to be the main cause of air pollution, 27% attributed it to construction activities, and 20% believed stubble burning to be the major cause of air pollution in Delhi NCR.

In Group 2, 33% of the respondents believed burning of waste was responsible for air pollution, 27% deemed deforestation a culprit, and 20% thought industrial activity was a major cause of air pollution.

3. Awareness of air pollution-related terminology was significantly lower among the urban poor:

Only 10% of Group 1 respondents were aware of air pollution terms like AQI and PM 2.5, while 71% of Group 2 respondents were aware of the same. This indicates asymmetry in public knowledge of terminology related to air pollution.

- 4. Negative health impacts self-reported by one-third of the respondents: 46% of the respondents in Group 1 reported health effects of air pollution, and 21% of the Group 2 respondents reported costs incurred from visits to the doctor and medical bills. Overall, 33% of respondents personally experienced negative health impacts of air pollution.
- 5. People across socio-economic categories take measures to reduce air pollution exposure: While respondents in Group 2 tried to reduce individual exposure to air pollution by buying air purifiers and indoor plants, Group 1 respondents identified different and comparatively less costly solutions, like increasing their water intake and using N-95 masks.

Policy for reducing air pollution and its health impacts can be put in place only with strong demand from an informed population. Only education and awareness can guarantee that. 6. While respondents across socio-economic groups find the government's efforts to reduce air pollution to be inadequate, Group 2 respondents do not see air pollution reduction as a priority of governance: Both Group 1 and Group 2 respondents rated the government's performance on reducing air pollution as unsatisfactory (4.5/10). This indicates public dissatisfaction with government interventions to curb air pollution. However, when asked what their priorities would be if they were the Chief Minister, Group 1 respondents rated reduction of air pollution as the fourth priority and Group 2 respondents rated it as the ninth priority.

Based on the research outcomes, Chintan suggests the following steps to reduce public exposure to air pollution, enabling people to protect themselves.

EDUCATION AND AWARENESS

Social Media as a Platform for Education

The study indicates that respondents trust social media as a reliable source of information on air pollution, particularly younger populations, who will act as future decision makers and drivers of the economy. Therefore, credible scientific institutions and authorised government agencies must regularly provide accurate and verified data on air pollution, along with scientific solutions through social media campaigns and a regular flow of news.

Air Pollution Awareness in Educational Institutions

An understanding of science and protection against exposure to air pollution is vital for sustained and effective public action. Air pollution science, emphasizing prevention and reduction of exposure must be compulsory for students in class 8, 9 and 10. Colleges must also offer courses to generate interest and understanding of air pollution science amongst students.

Urban Local Bodies (ULBs) and Residential Welfare Associations (RWAs): Champions for Air Pollution Awareness

Civil society bodies with expertise on air pollution can work in partnership with Urban Local Bodies (ULBs) and RWAs, to provide easy-to-understand scientific information on air pollution. The general public will gain knowledge for prevention and reduction of exposure to air pollution, particularly for vulnerable populations such as the elderly, children, pregnant and lactating women.

STEPS FOR EXPOSURE AND HEALTH IMPACT REDUCTION

Pollution Prevention Kits

Social security schemes by ULBs must provide pollution prevention kits on a fortnightly basis, with items such as N-95 masks and industry-standard protective eyeglasses. Beneficiaries must include outdoor essential workers like street vendors, waste pickers and safai karamcharis, among others. For maximum reach, these schemes can be widely

advertised on television, social media, radio and newspapers, along with an organized system for distribution and last-mile delivery.

Engaging doctors and paramedical professionals

Doctors and paramedical professionals in each ward, along with state health departments, must be trained to handle health impacts of air pollution and counsel patients with scientific solutions.

Innovation for low-cost Heating Solutions

Open burning during winters for heat is a significant source of air pollution. Often, outdoor essential workers or those living without shelter have no option but to burn waste to remain warm. The Central Pollution Control Board (CPCB) can invest in innovation by supporting technical experts, startups, civil society bodies etc. to develop low-cost heating solutions. Clean alternatives to burning can be scaled up with government intervention.

Strong action against open burning and violation of construction norms

The state pollution control boards must work closely with ULBs, scientists, civil society bodies and RWAs to penalize open burning and violations of construction and demolition norms.

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"WE DO NOT BREATHE THE SAME AIR"

Chintan Environmental Research and Action Group 238 Sidhartha Enclave, New Delhi-110014 Tel: +91 11 46574172 Email: info@chintan-india.org Website: www.chintan-india.org